

CLAIMS:

1. A method of making at least one hole through an optically transparent body, said method comprising:
 - providing an ultrashort pulse laser for producing a laser output with a wavelength λ , said laser output having a subpicosecond laser pulse duration;
 - providing a laser output focusing lens for focusing said laser output, said focusing lens having a numerical aperture NA;
 - providing an optically transparent body, optically transparent body having a transparency at λ of at least 90%/cm;
 - providing a liquid filled container situated proximate to at least a portion of said optically transparent body, such that said optically transparent body is in direct contact with said liquid; and
 - directing said laser output through said focusing lens to produce a focused laser output with a subpicosecond laser pulse duration proximate said optically transparent body, said focused laser output tracing at least one hole track pattern through said transparent glass body while said optically transparent body and said focused laser output move relative to one another in X-Y-Z directions;

wherein said at least one hole track pattern is in contact with said liquid and wherein said focused laser output in conjunction with said liquid create at least one hole in said optically transparent body.
2. The method of claim 1 wherein said hole track pattern has a width of at least 22 μm .
3. The method of claim 2 wherein said hole track pattern has a width of at least 50 μm .
4. The method of claim 3 wherein said hole track pattern has a width between 75 μm and 200 μm .
5. The method of claim 1, wherein said method further includes the steps of: providing a controllable positioning translation stage; positioning said optically transparent body within said stage; and translating said optically transparent body relative to location of said focused laser output.

6. The method of claim 1 wherein the speed of movement of said focused laser output relative to said optically transparent body is at least 10 µm/s.
7. The method of claim 6 wherein the speed of movement of said focused laser output relative to said optically transparent body is in the range of 50 µm/s to 250 µm/s.
8. The method according to claim 1, wherein pulse energy is at least 4 µJ.
9. The method of claim 1 wherein said optically transparent body comprises material selected from a group consisting of glass, glass-ceramic and sapphire.
10. The method of claim 9 wherein said glass body is an oxide glass body.
11. A method as claimed in claim 1, wherein providing an optically transparent body includes providing a silica glass with at least 100 ppm wt. OH.
12. A method as claimed in claim 1, wherein providing an transparent body body includes providing a silica glass with at least 500 ppm wt. OH.
13. A method as claimed in claim 1, wherein providing an transparent body body includes providing an uncerammed glass-ceramic glass.
14. A method as claimed in claim 13, wherein providing an uncerammed glass-ceramic glass is selected from a group consisting of an aluminosilicate glass green body, a glass which is cerammable into a negative thermal expansion glass-ceramic body, and a photosensitive nucleated glass.
15. The method of claim 1 wherein said liquid includes at least one of the following: (i) water, (ii) surfactant; (iii) methanol; (iv) acetone.

16. The method of claim 9, further including the steps of inserting an optical fiber into said hole, thereby providing a glass body with a hole containing optical fiber.
17. The method of claim 1, wherein said focused laser output in conjunction with said liquid create a plurality of holes in said optically transparent body.
18. The method of claim 17, said method including the steps of inserting an optical fiber into each of said holes of said glass body.
19. A method as claimed in claim 1, wherein providing said ultrashort pulse laser includes providing a < 100 fs pulse laser for producing a laser output having a < 100 fs laser pulse duration.
20. A method as claimed in claim 1, wherein providing said ultrashort pulse laser provides a laser output having a < 50 fs laser pulse duration.
21. A method as claimed in claim 1, wherein providing said ultrashort pulse laser produces a laser output having a ≤ 40 fs laser pulse duration.
22. A method as claimed in claim 1, wherein providing said ultrashort pulse laser produces a laser output having a $\geq 5 \mu\text{J}$ pulse.
23. A method as claimed in claim 1, wherein providing an optically transparent body is an oxide bulk glass body with a λ transparency $\geq 95\%/\text{cm}$.
24. A method as claimed in claim 1, wherein providing said ultrashort pulse laser includes providing a $\lambda < 1000$ nm laser.
25. A method as claimed in claim 24, wherein said wavelength λ is in the range of 800 ± 100 nm.

26. A method as claimed in claim 25, wherein λ is centered about 800 nm.
27. An optical device made by the method of claim 1.
28. A method as claimed in claim 1, wherein said hole track pattern through said oxide glass body comprises an outline shell hole track which surrounds an unexposed center glass volume which is detached from said oxide glass body to provide said hole.
29. A method as claimed in claim 28 wherein said outline shell hole track has a circular cross-section.
30. A method as claimed in claim 22 wherein said outline shell hole track has a divided circular cross-section.
31. A method as claimed in claim 28 wherein said outline shell hole track has a varying cross-section.
32. An optically transparent body, said body containing at least one laser traced outline shell hole track pattern having a cross-sectional width of $>22\mu\text{m}$, said laser traced outline shell hole track pattern traversing through at least a portion of optically transparent body.
33. A precision hole preform body as claimed in claim 32 wherein said laser traced outline shell hole track pattern has a cross-section with a circular geometry.
34. A precision hole preform body as claimed in claim 32 wherein said laser traced outline shell hole track pattern has a cross-section with an oval geometry.
35. A precision hole preform body as claimed in claim 32 wherein said laser traced outline shell hole track pattern has a straight side geometry.